Dr WILLIAM MAC CORMAC ON AMPUTATION OF THE THIGH

Forster & Co Dublin

OBSERVATIONS

ON

AMPUTATION OF THE THIGH,

AND ON THE MERITS OF THAT OPERATION AS COMPARED WITH

EXCISION OF THE KNEE.

BY

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FEW necessities, in many respects, are more painful than when amputation of the upper or lower extremity is required for disease of one of the articulations, whether it be of the thigh for disease of the knee, or of the arm for disease of the elbow. Sir William Fergusson, in his *Lectures on the Progress of Surgery*, styles amputation at once one of the meanest and greatest of operations. It is certainly, in the case of disease, a confession of failure—a rude, yet ready, and oftentimes effectual method of disposing of a difficulty we feel unable otherwise to surmount. Yet, as into the nature of many diseases we are confessedly unable to penetrate, as many are equally beyond the reach of our curative resources, and as injuries received, whether in war or in peace, seem only to increase in severity as civilization is said to advance, surely under circumstances such as these amputation has been rightfully called one of the greatest of surgical operations.

Most fortunately, in the case of disease of the elbow, the beautiful mechanism of the hand and forearm is now but rarely sacrificed, excision of this joint having proved eminently successful. When it was proposed to save the foot and lower limb by a similar operation practised upon the knee when attacked by disease, it is not surprising that the proposal should have been joyfully hailed, and in many instances extensively and enthusiastically adopted. Now, as chronic disease is found in the knee perhaps more frequently than in any other joint in the body, and as the results of treatment, especially in hospital cases, are but too often the reverse of satisfactory, it is the more necessary that every alleged improvement should receive our most careful consideration.

Since the revival of excision of the knee by Sir William Fergusson in 1850, the operation has been practised a large number of times, and although the materials are perhaps now available wherewith to form a tolerably correct estimate of its value, there is almost no established surgical procedure regarding which such wide differences of opinion exist, or about which controversy has more hotly raged.

No one will be disposed to deny that to preserve a strong and useful limb, firmly anchylosed at the joint, at an equal risk to life, is in every respect more praiseworthy and more surgical than to lop it off with the knife, and that where its preservation is practicable, to amputate would be an opprobrium of surgery. Nevertheless, as I conceive it to be our paramount duty to endeavour to preserve human life as well as limb, it becomes obligatory upon the surgeon to inquire not only into the abstract merits of every novel procedure, but very carefully into the effects it may have as to safety or otherwise. To this consideration I think every other should be forced to yield, and it is in the hope of adding something, however trifling, to the common fund of information, that I have ventured to place before the readers of this journal some observations on the question of amputation of the thigh, more especially in reference to excision of the knee-joint.

The idea was partly suggested by the history of a case of disease of the knee in a young girl, whose limb I was extremely unwilling to sacrifice. She was a pretty, delicate creature, only eighteen years of age, very thin, and very anxious-looking. She was first admitted to hospital, under my care, with simple synovitis of the right knee, in March, 1866, but had for several years been complaining from time to time of pain and uneasiness in the joint. After a month's treatment she was discharged relieved, only to be re-admitted a month afterwards. By appropriate means, and the opening of an abscess over the inner tuberosity of the tibia, she was again enabled to return home somewhat improved in health. At the end of September she sought admission a third time in much worse condition than before. A sinus leading to diseased bone existed where the abscess had been opened, and another had formed in the popliteal space. After trying various means without avail, an exploratory incision, cutting down upon the inner tuberosity of the tibia, was made, and a large quantity of carious bone gouged out. I hoped that the disease was subarticular caries, confined to this position, and the result for a time justified the expectation. The pain,

which previously had been almost excruciating and incessant, wearing the poor girl down, and causing her to implore relief, was completely removed, and she recovered so far as to return to her employment, and to obtain complete remission of all suffering for two or three months. Half a year later, on April 30, 1867, she came again to hospital. For the last few months the disease had been progressing rapidly, and she was suffering great pain and spending sleepless nights. The disease, which formerly appeared confined to the upper extremity of the tibia, now evidently implicated the lower end of the femur, which had become inflamed, and was covered with thickened periosteum for three inches up. The sinuses were unhealed and discharging ichorous pus. There was very little effusion into the joint, and not much into the tissues around it. Careful examination of the lungs failed to detect any marked disease, although the respiratory murmur was somewhat roughened. This case would not longer brook delay, and the question was whether to excise the joint or to amputate. The poor girl herself was most anxious that her leg, which was a shapely one, should not be sacrificed, and so I was myself, but I was constrained to adopt the latter mode, as I felt that her shattered constitution and wasted frame would not withstand the drain of such an operation as resection, even if she escaped its more immediate consequences. And here I would enter a protest against allowing the patient himself to decide such momentous questions. It is the business of the surgeon to do so, and he should not shirk his responsibility by trying to shift it to the shoulders of another, whose state of health and ignorance of the subject, so totally unfit him from arriving at a just conclusion.

On the 3rd May, after consultation with my colleagues, the patient was brought down to the theatre, submitted to the influence of chloroform, and the following operation performed. The point of the femur selected for division was just at the termination of the thickened and inflamed periosteum. An anterior oval flap, extending to the upper margin of the patella, was formed by cutting from without inwards, and included most of the soft parts on the front of the thigh. The flap at its base equalled half the circumference of the limb. A short posterior flap was then made by transfixing the limb. Both flaps having been retracted, a circular sweep of the knife was made at the point where the femur was to be sawn, and the bone carefully divided. The main vessel, and six smaller arteries having been secured, it was found that not an ounce of

blood had been lost. Six sutures brought the edges of the wound into accurate and easy apposition. Some strips of moistened lint, secured by a few turns of a bandage, were the only dressing.

On examination of the joint after removal, the disease was ascertained to be more extensive than had been supposed. The soft tissues were infiltrated with gelatinous material, the cartilages of incrustation removed, except a small patch over the external condyle, and on the external articulating surface of the tibia. The periosteum peeled easily off the femur up to one inch of the point of section. The cancellated structure of both tibia and femur was much degenerated and infiltrated with oily matter. Four inches of bone, at least, would have required removal before comparatively healthy surfaces of the femur and tibia could have been reached, and even with that the gouge would have proved needful.

Respecting the after progress of the case, nothing could have been more satisfactory. In twelve days the girl was convalescent, and in my note-book I find that on the 18th May, fifteen days after operation, it is reported she can bear firm pressure on the face of the stump without wincing, and that she was ordered to go out of doors to breath the open air in the hospital grounds for some hours daily. Her appetite is good. She sleeps well, and has no pain whatever. On June 4th she was able to bear the firmest pressure on the end of the stump without pain. The line of cicatrix is quite behind the bone, and out of reach of any pressure applied to the face of the stump. She was discharged on the 8th June, having been retained in hospital longer than was necessary, in order to exhibit the stump to the students. She was then reported as being in first-rate condition and in good spirits, having been a little over one month under treatment.

The lithograph illustrating this paper is drawn from a photograph taken upwards of a year after operation. The girl has grown quite fat, enjoys excellent health, and, considering her former position, has made a remarkable recovery. She has been for some time anxious to wear an artificial limb, but the circumstances of her friends render it difficult for her to obtain one. The stump is plump, the end of the bone is covered with a thick, movable cushion, against which the patient suffers to be made, without inconvenience, almost any amount of pressure.

Now, in the case of this girl I tried time after time all the means within my reach calculated to aid nature to restore the diseased joint and impaired constitution to health. At one time I almost

believed I had completely succeeded. The disease, however, returned and progressed, and, just before her last admission to hospital, so rapidly, as to show that no further time could be lost without destroying the patient's chances of life. Up till the last moment I was most anxious to have performed resection of the joint, but at the eleventh hour I had to abandon all idea of it. I became convinced, and it was also the unanimous opinion of my colleagues, that the girl would in all probability never survive the operation of excision. That she made a good recovery after her limb was amputated is abundantly clear. The history and termination of this case recal very forcibly the particulars of the last one, in which excision of the knee was performed in the Belfast Hospital. The patient was a well-nourished girl of eighteen. The knee had been the seat of chronic disease for five years. Apparently it was not extensive, and was confined chiefly to the end of the bones. There were no sinuses or collections of matter, and there was no visceral disease. Altogether the case seemed a most favourable one. After the operation, the shock and prostration which ensued, and continued a long time, were frightful. I have seldom seen greater, and in sixteen days she was dead from pyæmia. The H-shaped incision was employed, and the transverse wound healed; but I have often seen this healing, in the first instance, of wounds in cases which afterwards turned out unfavourably. I have now performed amputation of the thigh for disease of the knee-joint many times after the manner before described, and have good reason to be satisfied with the results.

The method of operation and employ is essentially similar in principle to that proposed by Mr. Teale, over which it possesses considerable advantages, without the imperfections which are unavoidable with the rectangular flaps. The profession were much struck with the advantages claimed for Mr. Teale's method of amputation, which was first, I believe, applied to operations on the thigh, and afterwards more extensively employed—and in the August number of this Journal for 1866 Mr. Croly enthusiastically advocates its superiority over other methods.

To me it has always appeared that the inordinate length of bone often necessarily sacrificed in order to fashion the flaps according to the prescribed rule was an objection which, if not insurmountable, counterbalanced, at least to a large extent, the advantages which might otherwise accrue. If any one will map out on a moderately muscular thigh the flaps necessary to amputate by Mr. Teale's

directions, the anterior being made to go as far as the upper border of the patella, he will be amazed, if he have not previously made the experiment, to see how far up the limb the bone must be sawn through. Indeed Mr. Teale admitted the force of this objection, and recommended that in a muscular limb the long flap should not be made so extensive, and that in amputations near the knee the flap should be dissected from the front of the leg, over the patella. It is not difficult to imagine several conditions, both of disease and accident, in which these suggestions would prove impracticable. It becomes, therefore, an important question, says Mr. Lister, in Holme's *System of Surgery*, whether the advantages of Mr. Teale's method may not be obtained in some less objectionable manner. Sédillot recommends a single, long anterior oval flap, and a transverse division of the posterior parts, which would involve a division of the bone nearly as high as in the rectangular, and the operation recommended by Mr. Spence is almost precisely similar. The operation I am in the habit of performing has the addition of a shorter posterior flap, which may be made to vary in length according to circumstances, but should not exceed half the length of the anterior one. Mr. Lister is much in favour of this form of amputation, and it seems to combine, with all the advantages, none of the disadvantages, of the method by rectangular flaps. No bone need be unnecessarily sacrificed, and as each inch of the femur adds, when divided higher up towards the trunk, about five per cent. to the rate of mortality, this is a matter of some importance. There is also a relatively smaller cut surface exposed than in Teale's operation. The flaps admit of exact coaptation, and the line of junction is at the most dependent part, but not underneath the stump, as in Teale's, where it must be subjected to pressure. There seems to be no tendency to protrusion of bone or to conical stump, which, from whatever cause, is not infrequent after amputation of the thigh, while the end of the bone is covered with a thick cushion very different from the thin tender skin which so often covers the end of a stump after the circular operation.

It is hardly necessary to detail the steps of the operation; the anterior flaps should be fashioned by a bold sweep of the knife right down to, or partially through the superficial muscles, which should be then rapidly dissected up. The posterior flap containing the large vessels and nerves is formed by transfixion, and by retracting the flaps, and sweeping the knife around the bone, it can be divided, if necessary, much higher than the base of the flap. Mr.

Luke recommends an operation just the converse of the one described, with the important exception that the flaps are equal in length. He first transfixes the posterior flap, and then dissects up the anterior. I am at a loss to see any advantage in this order of proceeding, and it is manifestly undesirable to divide the great vessels in the first incision, besides the extreme likelihood of splitting them or cutting them very obliquely. The after treatment I employ is always of the simplest kind. After the sutures are inserted, a few pieces of lint, wet in carbolic acid lotion, are passed over the face of the stump, and kept moist. I have never found any advantage from the mere application of the acid, either strong or diluted, to the cut surfaces, but rather the reverse. It is my constant practice to give such nourishing food as the patient can assimilate, from the very first. Of course general hygienic as well as moral influences should be always rigorously attended to.

In the very last case in which I operated, for very severe old-standing disease of the knee, intermediary hæmorrhage occurred, the stump filled with blood, required to be opened, and have the clots removed; oozing, however, continued, apparently from the entire surface of the flaps, or *a l'eponge*, and it was not until after iced water had trickled over them for some twenty-four hours that the bleeding was arrested. During this time the unopposed muscles retracted to a large extent, and it required very careful dressing for many days before the edges of the wound were again brought in contact, although the flaps seemed originally most ample. In spite of this untoward accident the patient recovered rapidly, being up and about in sixteen days. I have preserved, in a photograph, the appearances of the excellent stump which resulted. It is as good, if not better, than the one represented in the plate. I think it is extremely probable that protrusion of the femur would have resulted in this case, had the ordinary circular operation been selected.

I cannot agree with Mr. Lister in thinking that the skin should be dissected from the muscles when forming the posterior flap. It is a tedious and unnecessary complication of an operation, otherwise extremely simple, and capable of being performed with great rapidity. The retraction of the posterior muscles, which this modification is meant to counteract, is a gradual process, and I have never seen it excessive, while, if the anterior flap be sufficiently ample and well formed, this retraction proves of ultimate advantage by drawing the line of cicatrix further back.

On looking over the published accounts and statistical tables of amputations, and the mortality after various operations, one cannot fail to be surprised at the enormous discrepancy between the statements of different authors. Of no operation can this be said with, perhaps, greater force than of amputation of the thigh. We find Mr. Syme alleging the average mortality to be not less than from 50 to 70 per cent., according to the stern evidence of hospital statistics. M. Legouest has collected 2,274 cases from various sources, amongst which there was a mortality per cent. of 84·79. In the French army in the Crimea the mortality was 91·90, in the English it was only 65·20, while in the late American war it was 64·43. In civil practice it is, of course, much less, being 41·6 according to Mr. Lane's statistics, and the records of the New York and Pennsylvania hospitals give an estimate, almost equal, of 41·4. With such various amounts, one is inclined to agree with Gross when he states "that the mortality after operations is influenced by so many extraneous and intrinsic influences, that it is extremely difficult, if not impossible, in the existing state of science, to arrive at any satisfactory conclusions respecting it."

No doubt much confusion is attributable to the manner in which statistics are in many instances compiled, no discrimination being made between amputations for disease and injury; no allowance granted for the age and sex of the patient; and, what is of the last importance, no stress laid upon the part of the limb at which the operation has been practised. Now it is well ascertained that amputation performed for disease is vastly less fatal than when necessitated by injury; that amputation is less fatal in women than in men; that amputation, even of the thigh, is rarely fatal in young children, and that the proximity of the incisions to the trunk has an enormous influence on the death-rate.

Now, the amount of mortality after amputation of the thigh is of especial importance, being an essential consideration when estimating the value of excision of the knee-joint. I think it may be assumed that the relative desirability of, and danger to life in, these two operations are still matters somewhat warmly disputed. For while Sir William Fergusson, Mr. Butcher, Mr. Henry Smith, and the late Mr. Price have contended that the dangers of the operation of excision of the joint are even less than those apt to occur after amputation through the thigh, other distinguished surgeons may be cited who entertain very different opinions. If I interpret them aright, Mr. Syme, Mr. Coote, Mr. Timothy Holmes, Dr. Hodges, of Boston,

and others, esteem excision as not only more dangerous to life, but as presenting advantages which must often be considered highly problematical, or attainable only at immense cost. To endeavour to place the facts in a manner which may tend in any way to determine this vexed question cannot be regarded as without importance.

In the first place we should be mindful to institute a fair comparison, and not to contrast, for example, excisions of the knee for disease, as they almost exclusively are, with amputation of the thigh, whether performed for disease or injury. Amputation for injury should be compared with excision for injury, and amputation for chronic disease, and for disease of the knee-joint in particular, is the only fit subject with which to contrast excision of that articulation when diseased.

To form a just conclusion respecting the mortality after the excision of the knee for injury, there is hardly sufficient material. Eleven cases are recorded in circular No. 6, by the Surgeon-General of the United States army, where resection had been performed for gunshot wounds. Of these nine died, and as of one of the recoveries it is stated in the circular that "the success claimed is so extraordinary as to suggest some doubts of its authenticity," we may fairly exclude it from our consideration. Indeed the published account of this case bears internal evidence of the justice of the Surgeon-General's remark. In a paper recently published in the *Archives Générales de Médecine*, M. Spillmann has collected particulars of twenty-one cases where resection of the knee has been resorted to in military surgery, and nineteen times a fatal result is said to have ensued. This does not include the Alumbaugh case in 1858, when a native soldier had his right knee excised, and the left thigh amputated at the same time. As might be expected, he never rallied from the shock.

This is, without doubt, a frightful amount of mortality, and the conclusion M. Spillmann arrives at few will be disposed to dispute. He says, that "Toutes les illusions doivent tomber devant une pareille expérience. La résection ne peut s'appliquer à la chirurgie d'armée, si ce n'est dans des conditions très exceptionnelles." Military surgery, however, affords no fair criterion of the fatality of the operation in itself. The exigencies of the field of battle and of the camp, afford but little opportunity for that careful after-treatment and repose so necessary to ensure success; and the injuries inflicted by modern projectiles are so severe and extensive, especially of the

bones, that it is difficult to ascertain the actual extent of the damage previous to operation. In civil practice, when the operation has proved necessary for injury, the results, so far, have been very encouraging. M. Spillmann has given details of thirteen cases with only three deaths. One of the fatal cases, that of Mr. Hutchinson, being from tetanus—the patient at the time was progressing favourably.

In some of the instances referred to, the majority of which were young subjects, the operation was performed at short periods after the accident, when inflammation had set in, and under circumstances that would have rendered amputation probably, if not certainly, fatal. Although the cases prove few in number, the results are striking, and should certainly encourage us to attempt the preservation of limbs by resection of the knee, which by gunshot or other injuries of the articulation, would otherwise have been certainly condemned to amputation.

The question, however, of the desirability of excision of the knee for disease of the joint, is of much greater importance, owing to the comparative frequency with which it has been lately practised. I do not mean to advert to this method of treatment as applied to cases of deformity of the lower limb, the consequence of previous disease, further than to say, that I think our experience, although somewhat limited, distinctly forbids our performing the operation as one of expediency in persons in health. Dr. Hodges tabulates nineteen cases, of which eight died, the fatal termination being, in each case, more or less directly due to the operation itself. I have to thank Mr. Bryant for informing me of a case in which he recently removed a wedge of bone for synostosis of the articulation at a right angle. Death took place from pyæmia. Twenty cases, and nine deaths, only affords one more example of the fatality which seems invariably to attend *operations de complaisance*.

Mr. Butcher, an ardent advocate of excision, quotes in his work on "Operative and Conservative Surgery" some very limited tables of amputations of the thigh, namely, 19 cases of injury, and 34 of disease, from Mr. Erichsen, with a mortality, respectively, of 58 and 20·5 per cent.; and from Malgaigne's statistics of the Parisian hospitals, 46 cases of injury and 143 of disease, the mortality per cent. being in the first 75, and in the latter, 60 per cent. From these statistics he draws the following conclusions, that "these tables, when contrasted with my second upon excision of the joint, set at rest for ever the question of the comparative danger of the

two operations. In these we have forcibly demonstrated that *the danger of excision is considerably less than that attending amputation of the thigh.*" The italics are Mr. Butcher's; who further adds, that "the wound necessary for the removal of the diseased bones is less extensive than that attending amputation of the thigh, whether performed by the circular or the flap operation." It is a matter of small consequence, except so far as it affects the life of the patient, and the results of the operation, which wound is the larger. To me, however, it would appear that the extent of wounded surface exposed during excision must be fully as large, if not larger, than when a limb of equal size is amputated in the lower third. Regarding Mr. Butcher's first assertion, that the question of the comparative danger of the two operations is "set at rest for ever," I must, with every respect for that eminent surgeon's experience, entertain a different opinion. The conclusion is based on only 31 cases, of which it appears that 5 died. The number is far too small from which to make so sweeping a statement. Besides, to show how readily error may inadvertently creep, even into the most carefully prepared statistics, I may mention that in one of the cases, that of the late Dr. Stewart, of the Belfast Hospital, which is quoted in the table as "encouraging," a fatal result ensued in a few weeks. This would give a mortality of 19·35 in the 31 excisions, or only 1 per cent. less than the mortality of amputation of the thigh for disease, as given by Mr. Erichsen. This is rather too small a margin. I do not compare this result with Malgaigne's statistics, since excision of the knee is an operation, to a large extent repudiated by French surgeons, many of whom have denounced it in strong language, and I am unaware of any statistics of excision as practised in Parisian hospitals. Mr. Butcher gives two other tables; one comprising operations of excisions from 1762 to 1849, 31 in number, with 17 deaths; his last table contains 51 cases and 10 deaths, being down to December, 1856. Of these, however, a good many are simply recorded as "recovering," so that for statistical purposes they are not of much value, and to the first category of cases Mr. Butcher deprecates any allusion. It is assumed, and perhaps correctly, that imperfections in the methods of selection, of operation, and of after-treatment, were the causes of the excessive mortality in the earlier history of the operation. I think we may, with justice, set against these objections the certain fact that a considerable number of patients who have had their knees excised in recent times, have died, and have had nothing more said

about them. In all then, we have, in Mr. Butcher's work, a total of 113 cases, with 33 deaths, from one cause or other, a mortality of 29·20 per cent. One or two cases in the first table were for injury, but all the rest were for disease.

Since Mr. Butcher wrote, tables, much more ample and satisfactory, have been compiled, and the means of arriving at a more correct estimate, though still, to a certain extent, inadequate, are forthcoming.

Perhaps the most complete have been those of Dr. Oscar Heyfelder, of St. Petersburg, and Dr. Richard Hodges, of Boston, published in 1861. The former writer gives the aggregate results of 2,241 cases of excision of bones and joints. The number given of the knee is 213, with 64 deaths and 129 recoveries, being a mortality of 30·04 per cent. Dr. Hodges' monograph is both able and interesting, and he deals with the entire question of excision of joints in a truly scientific spirit. He gives, amongst other tables, one of all the excisions undertaken since 1850 for chronic disease of the knee alone. He acknowledges his indebtedness to Mr. Butcher for 65, and to Heyfelder for 35 of the cases, which amount to 208 in number. Of the whole number, 106 recovered, 60 proved fatal, and 42 patients underwent subsequent amputation. This gives a mortality of 28·84 per cent., chiefly from pyæmia and exhaustion. These last figures probably give a tolerably fair and exact estimate of the fatality attending excision of the knee for disease, with all the advantages which modern skill and experience have suggested, and these consist in little else than enforcing rest by suitable means, and interfering as little as possible with the wounded limb. We have, of course, to take account of those cases which underwent amputation subsequently, implying a failure of the original operation, and which amount in the table to more than 20 per cent. of the total number.

Excluding the earlier cases, up to 1850, recorded in the tables of the late Mr. Price, out of which more than half died, there appear in that surgeon's interesting monograph, some 240 cases of excision performed by British surgeons for disease and deformity, and 53 additional ones are mentioned by Mr. H. Smith, in a note, with a total, when taken together, of 67 deaths, or 22·86 per cent. In 44, however, amputation was subsequently performed. Mr. Price has also given a table of 15 cases operated on by Dr. Heusser, of Zurich; of these 8 recovered and 6 died from the effects of the operation, while one died after amputation. With regard to some

more recent cases I have been able to collect from different sources, I find that in King's College Hospital Mr. Smith mentions there have been 53 operations up to 1865, with the considerable mortality of 17, or upwards of 32 per cent. In the Glasgow Infirmary there appear to have been 16 cases, of which 7 died from the operation, and 2 more after amputation, which had to be performed in three instances. Dr. P. H. Watson has recently published an interesting account of 12 cases in which he had himself occasion to excise the knee, six of them proving fatal. In the Belfast General Hospital the operation has only been performed six times; in five instances a fatal result ensued, while one recovered after amputation. In the London Hospital Mr. Curling informs me the operation is not much in vogue. During the last four years resection of the knee has been only twice performed—one case recovered and one died. In Guy's, Mr. Bryant writes to me to say that, so far as he can learn, excision of the knee for disease has only been three times performed. All three failed as cases of excision, and amputation was subsequently practised—one of the patients dying.

Through the courtesy of Mr. Holmes I possess the particulars of seventeen cases of excision performed in St. George's Hospital since 1863. One of them is still under treatment, and is likely, Mr. Holmes states, to prove fatal.[a] It may therefore be left to one side. Of the remainder four died, and one was subjected to re-excision, but with what result is not stated. Twelve of the patients were under fifteen years of age, the youngest being only four—a circumstance favourable to successful excision. In the Royal Infirmary of Bristol there have been since 1860 six cases of excision. None of them died, but in three instances amputation proved necessary. Mr. Crosby Leonard, through whose kindness I obtained the information, does not mention what amount of usefulness was attained by the limb in the three successful cases.

In St. Thomas's Hospital the practice of Mr. Le Gros Clark has been attended with striking success. He has operated a dozen times. In only one instance, that of a strumous child, was the operation primarily fatal. The patient never rallied afterwards. In a young woman of eighteen, excision proved successful in the first instance, as firm osseous union took place between the opposed ends of the tibia and femur. The patient went to the sea-side, but returned to the hospital with recurrent caries, and rapidly declining

[a] I am informed by Mr. Holmes that this patient subsequently died, as he had anticipated.

health, compelling Mr. Clark to amputate fifteen months after the first operation, with a fatal result. In the letter this surgeon has favoured me with, he states, that with these two exceptions, all his cases have recovered, some with excellent limbs and scarcely perceptible lameness, others with firm but less sightly limbs. The period of recovery has varied considerably. He further adds:—"I think there is no doubt that early interference by operation favours success, but I am also satisfied that protracted rest will cure many cases where excision might get the credit if performed."

Adding these cases together, which have been collected without distinction from such sources as were available to me, we have an aggregate of 126 recent hospital cases, Dr. Watson's being, with one exception, operated on either in Chalmers's Hospital or the Royal Infirmary of Edinburgh, and of these 41 died from the operation, or 32·45 per cent., while 12 of the limbs were afterwards amputated, and of these 4 died. It should be mentioned that one of Dr. Watson's excisions was for injury.

In striking contrast to this high rate of mortality, is the extraordinary success attending the practice of some surgeons. Mr. Butcher has been successful in each of his six cases. Mr. Jones, of Jersey, had at one time nineteen excisions of the knee, with only one death; and although Mr. Humphrey, of Cambridge, has had but six deaths in thirty-two cases, he has found it necessary to amputate on eight occasions.

The determination of the amount of fatality after amputation is fortunately not surrounded by difficulties at all so great as those found in respect of excision. Extensive tables, bearing on the question, have been published from time to time, chiefly extracted from hospital records, and although they vary in some instances immensely, an analysis, carefully made, will detect the causes in some local circumstances, or in the manner they have been compiled. Mr. Lane's statistics, published in Cooper's Dictionary, give 641 cases of injuries requiring amputation, with a mortality of 57 per cent. In the Glasgow Infirmary, and in the Belfast General Hospital, it has been the same, amounting to 50 per cent.; whilst, as previously cited, it varies in war, from 64 in the American army, to 91·90 in the French during the Eastern campaign.

It is, however, with the mortality in operations performed for disease that we have now to deal. Mr. Lane's tables give 705 cases, with a percentage of 27·23 deaths. In some statistics published a few years back in the *Medical Times and Gazette*, the amputations of

the thigh and leg, in the London and provincial hospitals, during a period of three years, are tabulated. Of the former 303 cases are recorded in which the operation had been practised for disease, with 71 deaths, or 23·40 per cent. I have searched the register of our own hospital carefully for many years past, and find the fatality after amputation of the thigh, for disease generally, amounts to 32·35 per cent.

We know, however, that, irrespective of injury, disease of the knee-joint forms by far the most frequent cause of amputation of the thigh, and it becomes important to ascertain the percentage of death after this operation as correctly as possible. Mr. Bryant has pointed out, in a paper in the *Medico-Chirurgical Transactions*, on "The Causes of Death after Amputation," that amputations of the thigh for other diseases than that of the knee, such as, for example, different kinds of tumour, necrosis, elephantiasis, and deformities, are very fatal. In his paper 24 such cases, which are, to a certain extent, mere operations of expediency, are tabulated, with 11 deaths, or 45 per cent. In our own hospital 17 similar cases have resulted in death 13 times, an unusually large mortality.

On the other hand, Mr. Bryant gives 89 cases in which amputation was performed for chronic disease of the knee in Guy's Hospital, 13 only, or 14·60 per cent., proving fatal. In the Belfast Hospital amputation has been performed for the same reason fifty-four times, and 10 cases ended fatally, being a mortality of 18·51 per cent.

From the Bristol Royal Infirmary I have obtained a record of 28 cases of amputation for disease of the knee, 5 of which terminated fatally. In 2 of the fatal cases the patients were respectively sixty and seventy-five years old, and 3 of the deaths were caused by phthisis, soon after the operation. From St. George's Hospital Mr. Holmes has furnished me with a list of 20 amputations for diseased knee-joint, which have occurred since 1865. Five cases, all adult patients, proved fatal. Mr. Holmes has also published an account of 35 cases in the *Medical Times and Gazette* for 1861, which underwent amputation for a similar cause prior to that date. Of this number 5 were fatal. In the same Journal for 1860 a statistical report is given of the operations in 16 provincial hospitals during 1859. Amongst them are 35 cases of amputation for chronic disease of the knee, with only 2 deaths. If these be added together we have a total of 261 cases of amputation of the thigh for chronic disease of the knee-joint. Of these 40 terminated in death, being a mortality of 15·32 per cent. But supposing these last 35

cases be not included in the computation, as affording an unusually high average, we have still 226 cases of this amputation with 38 deaths, or 16·81 per cent. This, it must be conceded, forms a striking contrast to the death rate in the 126 cases of excision, collected together in a precisely parallel manner, which amounts, as before stated, to 32·45 per cent.

No one will, I presume, be disposed to deny the importance of trustworthy statistics. If confidence can be placed in the manner in which they have been compiled, and in the sources whence they are derived, they must prove of great value, more especially if they be not mere numbers without knowledge; and nothing is, as I conceive, to be compared in this respect, for the purpose of procuring reliable returns, with the publicly-kept register of a general hospital.

As has been previously insisted upon, it is with amputation of the thigh for chronic disease of the knee-joint that excision can alone be correctly compared. It must be remembered, too, that amputation has to be performed on all sorts of cases, however desperate, in order to afford the patient a chance of life, whilst excision is practised, or should only be practised, on well-selected cases—cases, in short, which, if submitted to amputation, would almost certainly prove successful. Indeed, when the necessity for amputation becomes at all urgent, excision is usually out of the question, and the knowledge of this fact is, perchance, calculated to induce surgeons to excise joints which might otherwise have been restored to health by less radical measures. Again, in the statistics of amputation it may safely be assumed that the results of all cases, successful as well as unsuccessful, are recorded; whereas, in respect of a comparatively novel surgical method like excision, it may be quite as certainly concluded that a greater proportionate number of unsuccessful results have never been made public.

The inferences I should feel disposed to draw from the foregoing considerations are, that it would appear, firstly, that the death-rate after excision of the knee is at least twice as great as that after amputation of the thigh, both being had recourse to on account of disease of the articulation, and this does not take into account the frequent failures of the operation, entailing subsequent amputation, and occasionally death. Secondly, that the experience we possess, although still very limited, is distinctly in favour of resection of the joint for severe injury in civil practice, and that amputation, under these circumstances, formerly the invariable rule, may often

prove unnecessary. Thirdly, that in military practice there seem to be no grounds for entertaining a hope of the successful performance of excision of the joint for gunshot wounds.

I do not wish to be understood to deprecate the operation of excision of the knee in eligible cases, as I consider it a surgical achievement of the first magnitude; and in many instances which have turned out successfully, the admirable result obtained, surpassing as it does any which may be attained by amputation, compensates for the increased risk, and prolonged and anxious after-treatment required. What I do object to, however, is the apparent desire evinced by some surgeons to shut their eyes to everything unfavourable to excision, while they as persistently ignore everything to the advantage of amputation. It is always in the interest of scientific truth that facts should be clearly and undisguisedly stated. I think the conclusion irresistible that the operation of excision of the knee is both more severe and more fatal than amputation; and that the prolonged after-treatment, extending over months, as compared with weeks in the case of amputation, exposes the patient, of necessity, to a greater number of the accidental risks incident to all operations. Amongst other considerations it should not be altogether forgotten that ordinary skill suffices for the after-management of a case of amputation, whereas difficulties, causing much anxiety and entailing the exercise of no ordinary care, are of frequent occurrence when excision has been performed. This objection is of small weight as applied to hospital cases, but it must have a certain influence upon the general introduction of the operation under circumstances where all the advantages of trained nurses, skilled assistants, and patient personal superintendence on the part of the surgeon himself are not so readily available.

Since writing these remarks, I have read with the most unmixed pleasure and satisfaction Mr. Holmes' recently-published work on the *Surgical Diseases of Children*, in the course of which he devotes a chapter to "excision of the knee." After stating that he entertains so sincere an admiration for the operation as to believe that it will bear the truth to be told about it, Mr. Holmes adds that he believes it to be more fatal than amputation, and that he is aware of no reason why, under any circumstances, it should prove less so, being, in his opinion, a proceeding of at least equal, if not greater, severity. "But even," says this author, "if I thought that excision would always continue to prove more fatal than amputation, I

should still practise it, because I think its results, when it succeeds, are so good that we are justified in running some extra risk to secure them."

I was much gratified to find the opinions I have endeavoured to justify in the foregoing paper were almost identical with those of a surgeon who had won for himself so eminent a position by hard and honest work.

I think enough has been now said to prove that excision of the knee is an operation only to be preferred to amputation where the circumstances of the case are very exceptionally favourable, and only after the most mature deliberation. At the same time I entertain the sincere conviction that the excision of joints, both for disease and for injury, is, in suitable cases, a real progress both in the principles and practice of surgery.